

REMARKS

Claims 9-14 and 21-23 remain pending in the application.

Reexamination and reconsideration of the application are respectfully requested in view of the remarks below.

35 U.S.C. §§ 102 and 103

The Office Action rejects claim 9 under 35 U.S.C. § 102 over Todokoro et al. U.S. Patent 5,594,245 ("Todokoro"), and claims 10-14 and 21-23 under 35 U.S.C. § 103 over Todokoro in view of Masnaghetti et al. U.S. Patent 6,066,849 ("Masnaghetti").

Applicants respectfully traverse those rejections for at least the following reasons.

Claim 9

Both the method of claim 9 and Todokoro scan an inside of the contact hole with a beam of primary electrons.

However, it would appear that any similarity ends there.

Among other things, the method of claim 9 includes collecting secondary electrons that are generated by a reaction between the primary electron beam and an inside surface of the contact hole and that are emitted from the contact hole.

Applicants respectfully submit that Todokoro does not collect secondary electrons that: (1) are generated by a reaction between the primary electron beam and an inside surface of the contact hole, or (2) that are emitted from the contact hole.

Instead, Todokoro collects secondary electrons 5 generated from the surface portion of the device as a result of reflection electrons 6 that pass through the side wall of the hole 3 (see, e.g., col. 2, lines 48-52; col. 12, lines 28-40; FIG. 2). Todokoro does not collect any secondary electrons that are emitted from the contact hole.

Indeed, Todokoro specifically teaches that "secondary electrons 2 are absorbed by the sidewall" (col. 12, lines 48-49; col. 1, lines 50-53). So, instead, Todokoro teaches that the energy of the primary electron beam should be increased such that the

reflection electrons 6 will have sufficient energy to penetrate the side wall of the hole 3 and then react with the surface to generate secondary electrons 5 which Todokoro does measure.

Accordingly, for at least this reason, Applicants respectfully submit that Todokoro does not disclose the method of claim 9.

Also, the method of claim 9 includes determining whether a surface of the conductive layer is exposed through the contact hole in the insulating layer pattern based on a change in an amount of collected secondary electrons.

Applicants respectfully submit that Todokoro does not determine whether a surface of the conductive layer is exposed through the contact hole in the insulating layer pattern based on a change in an amount of collected secondary electrons.

Instead, Todokoro merely observes a bottom of a contact hole by measuring an amount of collected secondary electrons.

The Office Action states that:

6. Todokoro et al implicitly disclose determining whether a surface of the conductive layer is exposed through the contact hole in the insulating layer pattern based on a change in an amount of collected secondary electrons (col.12, lines 20-46). Todokoro et al disclose the ability to determine the composition of both the surface and bottom of a contact hole by the change of the collected secondary electron. Therefore, Todokoro et al discloses the ability to determine whether a conductive layer is exposed as claimed.

Applicants respectfully disagree. Below is the text of Todokoro at col. 12, lines 20-46:

20 When a hole in SiO₂ having an aspect ratio of about 3 and
a depth of 1.5 μm was observed, the ratio between signals
from the bottom and the surface was measured by changing
energy of a primary electron beam to obtain results as shown
in FIG. 12. Namely, the ratio between secondary electrons
25 generated by reflection electrons, and secondary electrons
generated by the primary electron beam, was measured. It
will be appreciated that the ratio is maximized around 100
kV of electron beam energy. When the primary electron
beam has low energy, reflection electrons are absorbed by
30 the side wall and therefore no secondary electrons are
generated by the reflection electrons. As the energy of the
primary electron beam increases, the number of reflection
electrons penetrating through the side wall increases and
hence the number of secondary electrons thereby generated
35 is increased gradually. However, as the energy is further
increased, the primary electron beam intrudes into the speci-
men more deeply and the number of reflection electrons
decreases, leading to a decrease in the number of secondary
electrons. This is the reason for existence of the maximum
40 value. Electron beam energy corresponding to the maximum
value is related to the depth and material of the hole. The
deeper the hole and the denser the material, the higher the
maximum value becomes.

45 FIG. 13 shows the relation between the aspect ratio and
the signal ratio obtained when a deep hole was observed by

Applicants respectfully submit that the cited text does not make any mention of: (1) any conductive layer at all; (2) determining any composition of a bottom of a contact hole; (3) determining anything at all from any change in the amount of collected secondary electrons.

Indeed, it appears that Todokoro is exclusively concerned with a ratio between secondary electrons collected from the surface, and the secondary electrons generated by reflection electrons from the bottom of a hole. Meanwhile, the only “composition” discusses in the cited text is the composition of the layer in which the hole is formed and through which the reflection electrons must pass via the sidewalls of the hole.

Accordingly, for at least these reasons, Applicants respectfully submit that claim 9 is clearly patentable over Todokoro.

Claims 10-14

Claims 10-14 depend from claim 9. Masnaghetti does not remedy the

shortcomings of Todokoro as set forth above with respect to claim 9. Therefore, Applicants respectfully submit that claims 10-14 are all patentable over any combination of Todokoro and Masnaghetti for at least the reasons set forth above with respect to claim 9, and for the following additional reasons.

Claim 12

Among other things, the method of claim 12 includes providing a reference graph which shows a change in the amount of secondary electrons detected in a standard state where the conductive layer is exposed with respect to a number of scans of primary electrons.

The Office Action fairly admits that both Todokoro and Masnaghetti fail to disclose any such reference graph.

Yet, without any support or citation to anything in the prior art, the Office Action just states that such a feature would have “obviously minimized operator error.”

Applicants traverse the rejection of claim 12 as lacking support in either the law or the facts.

M.P.E.P. § 2143 provides that:

“The teaching or suggestion to make the claimed combination must be found in the prior art, not in applicant’s disclosure.”

Furthermore, M.P.E.P. § 2144.03 provides that:

“there must be some form of evidence in the record to support an assertion of common knowledge. See In re Lee, 277 F.3d at 1344-45, 61 USPQ2d at 1434-35 (Fed. Cir. 2002); Zurko, 258 F.3d at 1386, 59 USPQ2d at 1697 (holding that general conclusions concerning what is “basic knowledge” or “common sense” to one of ordinary skill in the art without specific factual findings and some concrete evidence in the

record to support these findings will not support an obviousness rejection)."

(Emphasis added). See also In re Lee, 277 F.3d at 1343-44, 61 USPQ2d at 1433-34 (Fed. Cir. 2002) (the examiner's finding of whether there is a teaching, motivation or suggestion to combine the teachings of the applied references must not be resolved based on "subjective belief and unknown authority," but must be "based on objective evidence of record.).

Here, the motive suggested by the Office Action is apparently a hindsight rationale for a modification not found anywhere in the prior art. The Office Action does not point to anywhere in the cited references with the purported motive is given, nor did the Examiner submit an affidavit as required by 37 CFR 1.104(d)(2) if this proposed motive were based on facts within his personal knowledge (see M.P.E.P. § 2144.03). Applicants request such an affidavit if this rejection continues to be maintained based a motive for combination not explicitly suggested in the prior art.

Claim 13

Among other things, the method of claim 13 includes designating the conductive layer as exposed when the waveform of the sample graph overlaps the waveform of the reference graph, and designating the conductive layer as not exposed when the waveform of the sample graph is separated from the waveform of the reference graph.

Applicants see no mention whatsoever of these features in the Office Action.

Applicants respectfully submit that they have paid the appropriate fees and are entitled to a full, fair and complete examination of all of their claims.

The Examiner is respectfully requested to cite something in the prior art disclosing or suggesting the modification of Todokoro to include the features of claim 13, or to allow Applicants' claim.

Claim 21

Among other things, the method of claim 21 includes collecting secondary

electrons that are generated by a reaction between the primary electron beam and an inside surface of the contact hole and that are emitted from the contact hole for each of the N scans; and determining whether a surface of the conductive layer is exposed through the contact hole in the insulating layer pattern based on a change in an amount of collected secondary electrons as a function of the N scans.

For similar reasons to those set forth above with respect to claim 9, Applicants respectfully submit that both Todokoro and Masnaghetti fail to disclose any such features, and therefore no possible combination of Todokoro and Masnaghetti could produce a method including such features.

Accordingly, for at least these reasons, Applicants respectfully submit that claim 21 is patentable over any combination of Todokoro and Masnaghetti.

Claims 22-23

Claims 22-23 depend from claim 21 and are deemed patentable over Todokoro and Masnaghetti for at least the reasons set forth above with respect to claim 21, and for the following additional reasons.

Claim 22

Among other things, the method of claim 22 includes determining a scan number (X) among the N scans where a peak number of secondary electrons are collected, and comparing X to a reference value.

Applicants see no mention whatsoever of these features in the Office Action.

Applicants respectfully submit that they have paid the appropriate fees and are entitled to a full, fair and complete examination of all of their claims.

The Examiner is respectfully requested to cite something in the prior art disclosing or suggesting the modification of Todokoro to include the features of claim 22, or to allow Applicants' claim.

CONCLUSION

In view of the foregoing explanations, Applicants respectfully request that the Examiner reconsider and reexamine the present application, allow claims 9-14 and 21-


23, and pass the application to issue. In the event that there are any outstanding matters remaining in the present application, the Examiner is invited to contact Kenneth D. Springer (Reg. No. 39,843) at (703) 715-0870 to discuss these matters.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 50-0238 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17, particularly extension of time fees.

Respectfully submitted,

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